

Appendix A: National Primary Drinking Water Standards as of 10/03

| | Contaminant | MCL or TT ¹ (mg/L) ² | Potential health effects from exposure above the MCL | Common sources of contaminant in drinking water | Public Health Goal |
|-----|---|---|---|---|-----------------------|
| OC | Acrylamide | TT ⁸ | Nervous system or blood problems; increased risk of cancer | Added to water during sewage/ wastewater treatment | zero |
| OC | Alachlor | 0.002 | Eye, liver, kidney or spleen problems; anemia; increased risk of cancer | Runoff from herbicide used on row crops | zero |
| R | Alpha particles | 15 picocuries per Liter (pCi/L) | Increased risk of cancer | Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation | zero |
| IOC | Antimony | 0.006 | Increase in blood cholesterol; decrease in blood sugar | Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder | 0.006 |
| IOC | Arsenic | 0.010 as of 1/23/06 | Skin damage or problems with circula- tory systems, and may have increased risk of getting cancer | Erosion of natural deposits; runoff from orchards; runoff from glass & electronics production wastes | 0 |
| IOC | Asbestos (fibers >10 micrometers) | 7 million fibers per Liter (MFL) | Increased risk of developing benign intestinal polyps | Decay of asbestos cement in water mains; erosion of natural deposits | 7 MFL |
| OC | Atrazine | 0.003 | Cardiovascular system or reproductive problems | Runoff from herbicide used on row crops | 0.003 |
| IOC | Barium | 2 | Increase in blood pressure | Discharge of drilling wastes; dis- charge from metal refineries; erosion of natural deposits | 2 |
| OC | Benzene | 0.005 | Anemia; decrease in blood platelets; increased risk of cancer | Discharge from factories; leaching from gas storage tanks and landfills | zero |
| OC | Benzo(a)pyrene (PAHs) | 0.0002 | Reproductive difficulties; increased risk of cancer | Leaching from linings of water stor- age tanks and distribution lines | zero |
| IOC | Beryllium | 0.004 | Intestinal lesions | Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries | 0.004 |
| R | Beta particles and pho- ton emitters | 4 millirems per year | Increased risk of cancer | Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation | zero |
| DBP | Bromate | 0.010 | Increased risk of cancer | Byproduct of drinking water disinfection | zero |
| IOC | Cadmium | 0.005 | Kidney damage | Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints | 0.005 |
| OC | Carbofuran | 0.04 | Problems with blood, nervous system, or reproductive system | Leaching of soil fumigant used on rice and alfalfa | 0.04 |
| OC | Carbon tetrachloride | 0.005 | Liver problems; increased risk of cancer | Discharge from chemical plants and other industrial activities | zero |
| D | Chloramines (as Cl ₂) | MRDL=4.0 ¹ | Eye/nose irritation; stomach discomfort; anemia | Water additive used to control microbes | MRDLG=4 ¹ |

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|---|--------------|-----|--------------------|----|------------------|-----|------------------------|---|---------------|---|---------------|
| D | Disinfectant | IOC | Inorganic Chemical | OC | Organic Chemical | DBP | Disinfection Byproduct | M | Microorganism | R | Radionuclides |
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|-----|--|---|--|---|------------------------|
| OC | Chlordane | 0.002 | Liver or nervous system problems; increased risk of cancer | Residue of banned termiticide | zero |
| D | Chlorine (as Cl ₂) | MRDL=4.0 ¹ | Eye/nose irritation; stomach discomfort | Water additive used to control microbes | MRDLG=4 ¹ |
| D | Chlorine dioxide (as ClO ₂) | MRDL=0.8 ¹ | Anemia; infants & young children: nervous system effects | Water additive used to control microbes | MRDLG=0.8 ¹ |
| DBP | Chlorite | 1.0 | Anemia; infants & young children: nervous system effects | Byproduct of drinking water disinfection | 0.8 |
| OC | Chlorobenzene | 0.1 | Liver or kidney problems | Discharge from chemical and agricul- tural chemical factories | 0.1 |
| IOC | Chromium (total) | 0.1 | Allergic dermatitis | Discharge from steel and pulp mills; erosion of natural deposits | 0.1 |
| IOC | Copper | TT ⁷ ; Action Level = 1.3 | Short-term exposure: Gastrointestinal distress. Long-term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level | Corrosion of household plumbing systems; erosion of natural deposits | 1.3 |
| M | <i>Cryptosporidium</i> | TT ³ | Gastrointestinal illness (e.g., diarrhea, vomiting, cramps) | Human and animal fecal waste | zero |
| IOC | Cyanide (as free cyanide) | 0.2 | Nerve damage or thyroid problems | Discharge from steel/metal factories; discharge from plastic and fertilizer factories | 0.2 |
| OC | 2,4-D | 0.07 | Kidney, liver, or adrenal gland problems | Runoff from herbicide used on row crops | 0.07 |
| OC | Dalapon | 0.2 | Minor kidney changes | Runoff from herbicide used on rights of way | 0.2 |
| OC | 1,2-Dibromo-3- chloropropane (DBCP) | 0.0002 | Reproductive difficulties; increased risk of cancer | Runoff/leaching from soil fumigant used on soybeans, cotton, pine- apples, and orchards | zero |
| OC | o-Dichlorobenzene | 0.6 | Liver, kidney, or circulatory system problems | Discharge from industrial chemical factories | 0.6 |
| OC | p-Dichlorobenzene | 0.075 | Anemia; liver, kidney or spleen damage; changes in blood | Discharge from industrial chemical factories | 0.075 |
| OC | 1,2-Dichloroethane | 0.005 | Increased risk of cancer | Discharge from industrial chemical factories | zero |
| OC | 1,1-Dichloroethylene | 0.007 | Liver problems | Discharge from industrial chemical factories | 0.007 |
| OC | cis-1,2-Dichloroethylene | 0.07 | Liver problems | Discharge from industrial chemical factories | 0.07 |
| OC | trans-1,2- Dichloroethylene | 0.1 | Liver problems | Discharge from industrial chemical factories | 0.1 |
| OC | Dichloromethane | 0.005 | Liver problems; increased risk of cancer | Discharge from drug and chemical factories | zero |
| OC | 1,2-Dichloropropane | 0.005 | Increased risk of cancer | Discharge from industrial chemical factories | zero |
| OC | Di(2-ethylhexyl) adipate | 0.4 | Weight loss, liver problems, or possible reproductive difficulties | Discharge from chemical factories | 0.4 |
| OC | Di(2-ethylhexyl) phthalate | 0.006 | Reproductive difficulties; liver problems; increased risk of cancer | Discharge from rubber and chemical factories | zero |
| OC | Dinoseb | 0.007 | Reproductive difficulties | Runoff from herbicide used on soy- beans and vegetables | 0.007 |

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| OC | Dioxin (2,3,7,8-TCDD) | 0.00000003 | Reproductive difficulties; increased risk of cancer | Emissions from waste incineration and other combustion; discharge from chemical factories | zero |
| OC | Diquat | 0.02 | Cataracts | Runoff from herbicide use | 0.02 |
| OC | Endothall | 0.1 | Stomach and intestinal problems | Runoff from herbicide use | 0.1 |
| OC | Endrin | 0.002 | Liver problems | Residue of banned insecticide | 0.002 |
| OC | Epichlorohydrin | TT ⁸ | Increased cancer risk, and over a long period of time, stomach problems | Discharge from industrial chemical factories; an impurity of some water treatment chemicals | zero |
| OC | Ethylbenzene | 0.7 | Liver or kidney problems | Discharge from petroleum refineries | 0.7 |
| OC | Ethylene dibromide | 0.00005 | Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer | Discharge from petroleum refineries | zero |
| IOC | Fluoride | 4.0 | Bone disease (pain and tenderness of the bones); children may get mottled teeth | Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories | 4.0 |
| M | <i>Giardia lamblia</i> | TT ³ | Gastrointestinal illness (e.g., diarrhea, vomiting, cramps) | Human and animal fecal waste | zero |
| OC | Glyphosate | 0.7 | Kidney problems; reproductive difficulties | Runoff from herbicide use | 0.7 |
| DBP | Haloacetic acids (HAA5) | 0.060 | Increased risk of cancer | Byproduct of drinking water disinfection | n/a ⁶ |
| OC | Heptachlor | 0.0004 | Liver damage; increased risk of cancer | Residue of banned termiticide | zero |
| OC | Heptachlor epoxide | 0.0002 | Liver damage; increased risk of cancer | Breakdown of heptachlor | zero |
| M | Heterotrophic plate count (HPC) | TT ³ | HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is. | HPC measures a range of bacteria that are naturally present in the environment | n/a |
| OC | Hexachlorobenzene | 0.001 | Liver or kidney problems; reproductive difficulties; increased risk of cancer | Discharge from metal refineries and agricultural chemical factories | zero |
| OC | Hexachlorocyclopentadiene | 0.05 | Kidney or stomach problems | Discharge from chemical factories | 0.05 |
| IOC | Lead | TT ⁷ ; Action Level = 0.015 | Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities; Adults: Kidney problems; high blood pressure | Corrosion of household plumbing systems; erosion of natural deposits | zero |
| M | <i>Legionella</i> | TT ³ | Legionnaire's Disease, a type of pneumonia | Found naturally in water; multiplies in heating systems | zero |
| OC | Lindane | 0.0002 | Liver or kidney problems | Runoff/leaching from insecticide used on cattle, lumber, gardens | 0.0002 |
| IOC | Mercury (inorganic) | 0.002 | Kidney damage | Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands | 0.002 |
| OC | Methoxychlor | 0.04 | Reproductive difficulties | Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock | 0.04 |

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| IOC | Nitrate (measured as Nitrogen) | 10 | Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome. | Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits | 10 |
| IOC | Nitrite (measured as Nitrogen) | 1 | Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome. | Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits | 1 |
| OC | Oxamyl (Vydate) | 0.2 | Slight nervous system effects | Runoff/leaching from insecticide used on apples, potatoes, and tomatoes | 0.2 |
| OC | Pentachlorophenol | 0.001 | Liver or kidney problems; increased cancer risk | Discharge from wood-preserving factories | zero |
| OC | Picloram | 0.5 | Liver problems | Herbicide runoff | 0.5 |
| OC | Polychlorinated biphenyls (PCBs) | 0.0005 | Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer | Runoff from landfills; discharge of waste chemicals | zero |
| R | Radium 226 and Radium 228 (combined) | 5 pCi/L | Increased risk of cancer | Erosion of natural deposits | zero |
| IOC | Selenium | 0.05 | Hair or fingernail loss; numbness in fingers or toes; circulatory problems | Discharge from petroleum refineries; erosion of natural deposits; discharge from mines | 0.05 |
| OC | Simazine | 0.004 | Problems with blood | Herbicide runoff | 0.004 |
| OC | Styrene | 0.1 | Liver, kidney, or circulatory system problems | Discharge from rubber and plastic factories; leaching from landfills | 0.1 |
| OC | Tetrachloroethylene | 0.005 | Liver problems; increased risk of cancer | Discharge from factories and dry cleaners | zero |
| IOC | Thallium | 0.002 | Hair loss; changes in blood; kidney, intestine, or liver problems | Leaching from ore-processing sites; discharge from electronics, glass, and drug factories | 0.0005 |
| OC | Toluene | 1 | Nervous system, kidney, or liver problems | Discharge from petroleum factories | 1 |
| M | Total Coliforms (including fecal coliform and <i>E. coli</i>) | 5.0 percent ⁴ | Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present ⁵ | Coliforms are naturally present in the environment as well as feces; fecal coliforms and <i>E. coli</i> only come from human and animal fecal waste | zero |
| DBP | Total Trihalomethanes (TTHMs) | 0.10 0.080 after 12/31/03 | Liver, kidney or central nervous system problems; increased risk of cancer | Byproduct of drinking water disinfection | n/a ⁶ |
| OC | Toxaphene | 0.003 | Kidney, liver, or thyroid problems; increased risk of cancer | Runoff/leaching from insecticide used on cotton and cattle | zero |
| OC | 2,4,5-TP (Silvex) | 0.05 | Liver problems | Residue of banned herbicide | 0.05 |
| OC | 1,2,4-Trichlorobenzene | 0.07 | Changes in adrenal glands | Discharge from textile finishing factories | 0.07 |
| OC | 1,1,1-Trichloroethane | 0.2 | Liver, nervous system, or circulatory problems | Discharge from metal degreasing sites and other factories | 0.20 |

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|----|-----------------------|---|--|---|-----------------------|
| OC | 1,1,2-Trichloroethane | 0.005 | Liver, kidney, or immune system problems | Discharge from industrial chemical factories | 0.003 |
| OC | Trichloroethylene | 0.005 | Liver problems; increased risk of cancer | Discharge from metal degreasing sites and other factories | zero |
| M | Turbidity | TT ³ | Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches. | Soil runoff | n/a |
| R | Uranium | 30 ug/L as of 12/ 08/03 | Increased risk of cancer, kidney toxicity | Erosion of natural deposits | zero |
| OC | Vinyl chloride | 0.002 | Increased risk of cancer | Leaching from PVC pipes; discharge from plastic factories | zero |
| M | Viruses (enteric) | TT ³ | Gastrointestinal illness (e.g., diarrhea, vomiting, cramps) | Human and animal fecal waste | zero |
| OC | Xylenes (total) | 10 | Nervous system damage | Discharge from petroleum factories; discharge from chemical factories | 10 |

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NOTES

1 Definitions

- Maximum Contaminant Level Goal (MCLG)—The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
- Maximum Contaminant Level (MCL)—The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
- Maximum Residual Disinfectant Level Goal (MRDLG)—The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- Maximum Residual Disinfectant Level (MRDL)—The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- Treatment Technique (TT)—A required process intended to reduce the level of a contaminant in drinking water.

2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

3 EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- Cryptosporidium* (as of 1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99 percent removal.
- Giardia lamblia*: 99.9 percent removal/inactivation
- Viruses: 99.99 percent removal/inactivation
- Legionella*: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.
- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95 percent of the daily samples in any month. As of January 1, 2002, for systems servicing >10,000, and January 14, 2005, for systems servicing <10,000, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95 percent of daily samples in any month.

- HPC: No more than 500 bacterial colonies per milliliter
- Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005); Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.
- No more than 5.0 percent samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli*. If two consecutive TC-positive samples, and one is also positive for *E. coli* fecal coliforms, system has an acute MCL violation.
- Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.
- Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:
 - Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)
 - Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)
- Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10 percent of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.
- Each water system must certify, in writing, to the state (using third-party or manufacturers certification) that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05 percent dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01 percent dosed at 20 mg/L (or equivalent).